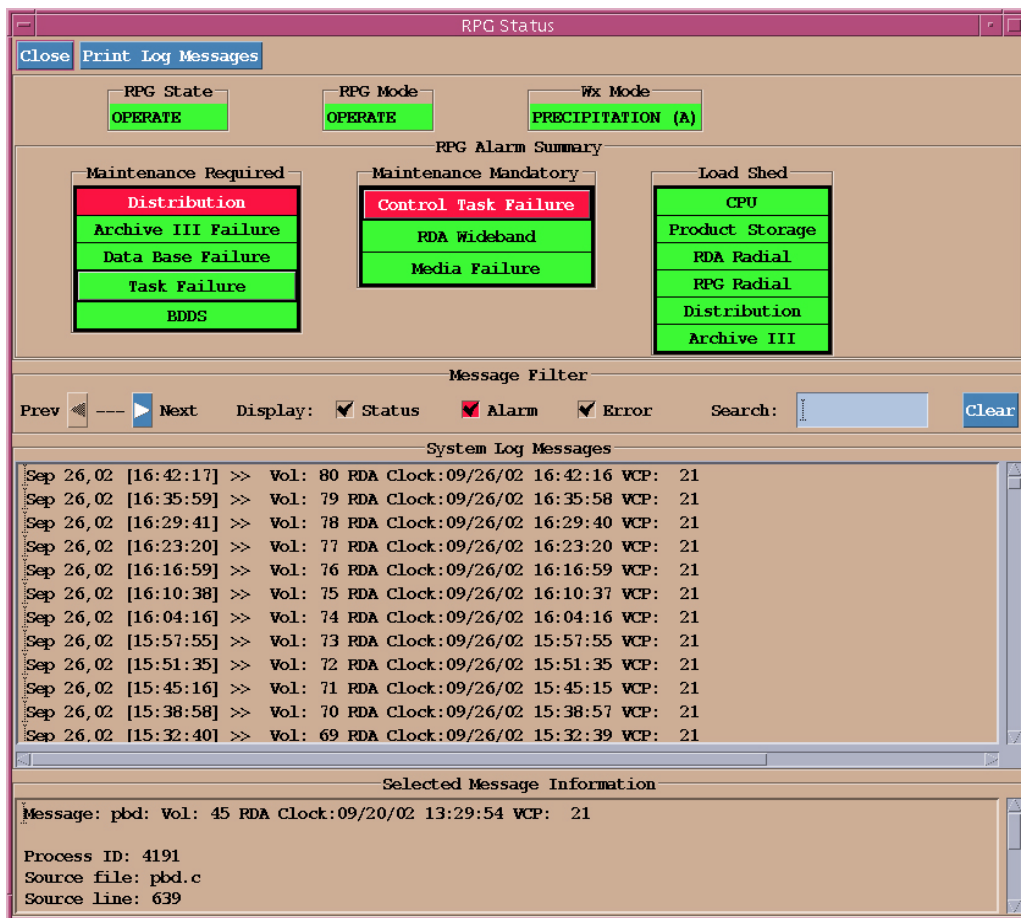


# RPG Build 3

# Training



Presented by the

Warning Decision Training Branch

## Overview

The RPG has an open system design that allows for frequent updates with respect to either hardware or software. Upcoming RPG Builds will be fielded in six month intervals. Each will have a blend of new science, upgrades to existing products or algorithms, as well as fixes.

This document will present highlights of the operationally relevant changes with RPG Build 3. Most of these changes will not be apparent until future AWIPS Builds are fielded. The Warning Decision Training Branch will provide more training on RPG Build 3 features as they appear in future AWIPS Builds at a later time. This document reflects WDTB's knowledge of the changes in RPG Build 3 and their future implementation in AWIPS. It was written just prior to the RPG Build 3 Deployment.

### **(With Build 3, the RPG's Operating System has been updated to Solaris 8)**

The following features of RPG Build 3 will be presented in this document:

1. The New Hodograph product from the WSR-88D VAD Wind Profile data.
2. User Selectable Layer Reflectivity Maximum product (ULR).
3. Implementation of the Blockage Algorithm.
4. Digital Storm-total Precipitation (DSP) product.
5. Data Quality Assurance Algorithm and improvements to the High Resolution Radial Based VIL Algorithm.
6. Improvements to the RPG HCI System Status Task.
7. Corrections to "residuals" in hourly-based precipitation products.

**8. Corrections to the generation of the Clutter Likelihood Reflectivity (CLR) and Clutter Likelihood Doppler (CLD)**

The Electronic Performance Support System (EPSS) has been updated to support the Build 3 changes that are apparent on the RPG Human Computer Interface (HCI).

A hodograph is a tool to allow forecasters to determine the potential for organized convection. The RPG Build 3 modified VAD Wind Profile product adds a new Tabular Alphanumeric Block (TAB) to the existing VWP product. Up to 4 pages may be added. The information will be stored based on heights.

**An AWIPS Hodograph Product will be available for request and display in AWIPS OB 1.**

The addition of the User Selectable Layer Reflectivity Maximum (ULR) product allows the user to select a specific, customized layer of reflectivity. The Legacy Layer Reflectivity Maximum (LRM) products consist of the low LRM (0-24 kft), medium LRM (24-33 kft) and high LRM (33-60 kft). The ULR offers the capability for the user to select both the lower and upper levels to design a product which will meet various forecasting needs such as a better understanding of storm structure and potential levels of icing (Bright Banding). The minimum thickness of the selected layer is 1 kft and altitudes from 0 to 70 kft may be selected. The ULR is a polar gridded product, while the legacy layer products are rectangularly gridded. The ULR's resolution is 1 km (.54 nm) x 1° and has a range of 230 km (124 nm). The Layer Composite

**Electronic Performance Support System (EPSS)**



**1. New Hodograph Product from VAD Wind Profile Data**

**2. User Selectable Layer Reflectivity Maximum Product**

	<p>Reflectivity task allows up to 10 layers per volume scan. This is 10 for all users, not 10 per user. Non-associated Users can only get previously generated products by doing one-time requests.</p> <p><b>The ULR product will be available for request and display in AWIPS OB1.</b></p>
<p><b>3. Implement Blockage Algorithm</b></p>	<p>The legacy Precipitation Processing Subsystem (PPS) Preprocessing Algorithm uses site specific Occultation and Hybrid Scan data. As currently implemented, the Preprocessing Algorithm requires that the 4 lowest tilts of each VCP contain identical angles (0.5°, 1.5°, 2.4° and 3.35°). In future RPG builds, there are plans to implement new VCPs containing different elevation angles which would cause significant errors in the PPS products. A proposed replacement for the Preprocessing Algorithm, the Enhanced Preprocessing (EPRE) algorithm, requires higher resolution blockage information than is currently available.</p> <p><b>VCP changes are scheduled to start with RPG Build 5. EPRE is also scheduled for RPG Build 5.</b></p>
<p><b>4. Digital Storm-total Precipitation (DSP) Product</b></p>	<p>The legacy Storm Total Precipitation (STP) product is a 16 data level product. Higher resolution data is needed by AWIPS applications such as Multisensor Precipitation Estimation (MPE - WFO version) and Flash Flood Monitoring and Prediction (FFMP), as well as applications external to NEXRAD.</p> <p>Full resolution (256 data levels) for storm total precipitation already exists within the processing stream of the RPG PPS. These data will now be</p>

formatted into a formal product - the Digital Storm-total Precipitation (DSP) product.

**It is unknown when the DSP will be available for display and request in a future AWIPS operational build.**

The DSP will not replace the STP, but will provide an additional source of data. The DSP will be generated every volume scan when the Precipitation Category assigned is “1” (Significant) or “2” (Light).

The DSP data level representation is based on an automatically-adjustable linear scale dependent upon the maximum storm accumulation. Level code 0 will correspond to no accumulation and level codes 1 through 255 will indicate accumulations, with a minimal step of 0.01 inches. For every multiple of 2.55 inches exceeded, the scale will increment by a corresponding integer multiple. That is, if the maximum exceeds 2.55 inches, the scale will become 0.02 inches; if the maximum exceeds 5.10 inches, the scale will become 0.03 inches, etc. The scale will be included in the product header, along with the maximum accumulation.

## Data Levels

The DSP data will be displayed on a polar grid (2 km x 1° resolution), with a range of 230 km (124 nm).

## Resolution and Range

The DSP will also contain alphanumeric data. These data pertain to four types of information:

1. Precipitation Status Message
2. Adaptation Data
3. Supplemental Data
4. Bias-related Information

**5. Data Quality Assurance Algorithm and High Resolution VIL Product**

Possible future applications of the DSP are:

1. replace Digital Hybrid Reflectivity (DHR) for use in the FFMP
2. input for the MPE (WFO version)

Note that both of the above would require the accumulation data to be translated to a 1 km x 1 km version of the HRAP grid.

The original implementation of the High Resolution VIL in Build 2.0 did not include newly tested logic that will be available for improving data quality, producing a cleaner more accurate product. The Data Quality Assurance (DQA) Algorithm is a separate front-end algorithm that will detect and flag Anomalous Propagation (AP), plus remove non-meteorological returns such as sun-strobes, bull's-eye and certain hardware failures. The DQA Algorithm does not mitigate non-meteorological returns on other products. The DQA Algorithm does not produce a product, but provides input for the generation of the High Resolution VIL product.

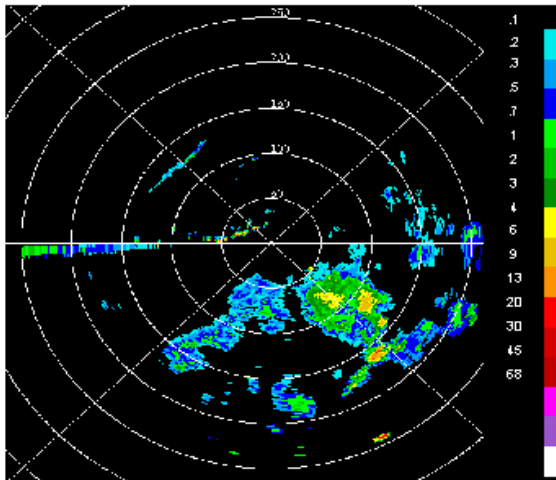
The High Resolution VIL (HRVIL) product is not a replacement for the existing gridded VIL product. The HRVIL has a 1° by 1 km (.54 nm) polar format with 256 data levels. It has a range of 460 km (248 nm).

Both the HRVIL and the DQA are sponsored by the FAA. The HRVIL is intended for display on the FAA Integrated Terminal Weather System (ITWS).

**Operational Impacts**

Applications of the HRVIL for NWS operations are unknown at this time. For example, research that applies to the gridded VIL product, such as the VIL of the day, is not valid for the High Resolution VIL, and must be evaluated at a later time.

It is unknown when the High Resolution VIL will be available for request and display in a future AWIPS operational build.

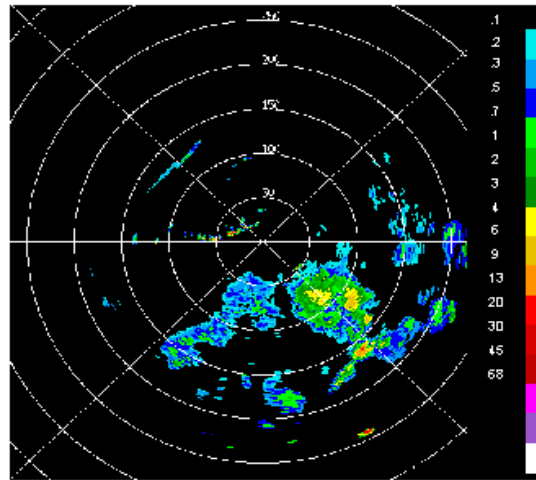


**Build 2 HiRes VIL product**

1 degree x 1 km resolution

Polar

256 data levels



**Build 3 HiRes VIL product**

DQA has edited for AP and artifacts  
(notice radial spike removed)

Otherwise same as Build 2

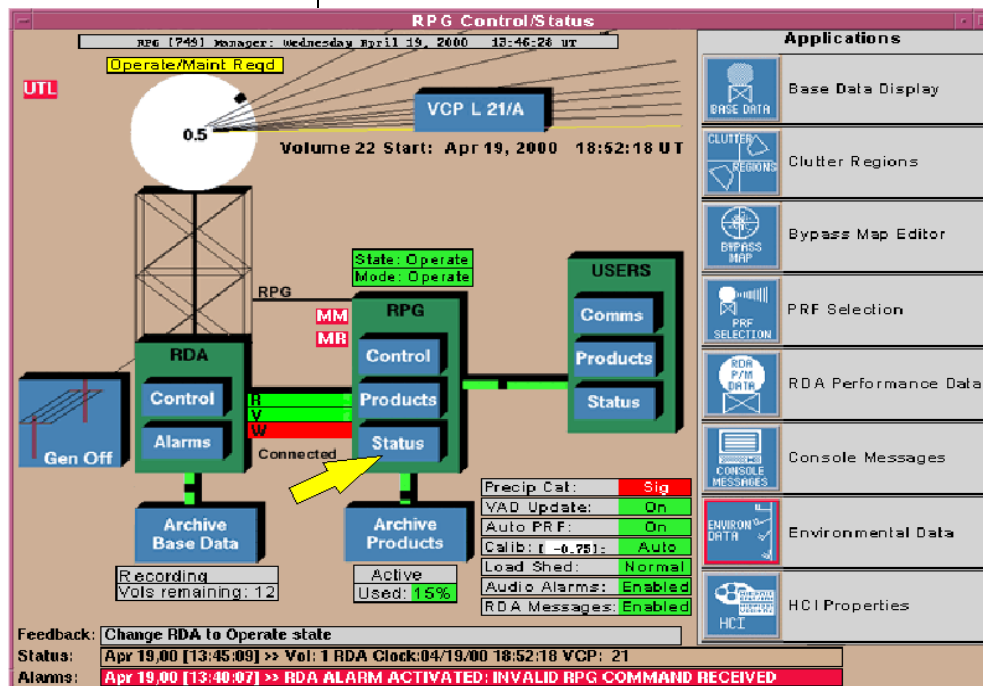
## Build 2 HRVIL vs. Build 3 HRVIL with DQA

There have been numerous complaints about how long it takes for the RPG Status window to display, particularly on a remote MSCF.

The solution is a RPG Status window which will bring up the most current 250 status messages (approximately 1 hour's worth of status messages), with the ability to scroll back through the older messages. No messages are lost and the current screen is automatically updated.

## 6. Improvements to RPG Status Window

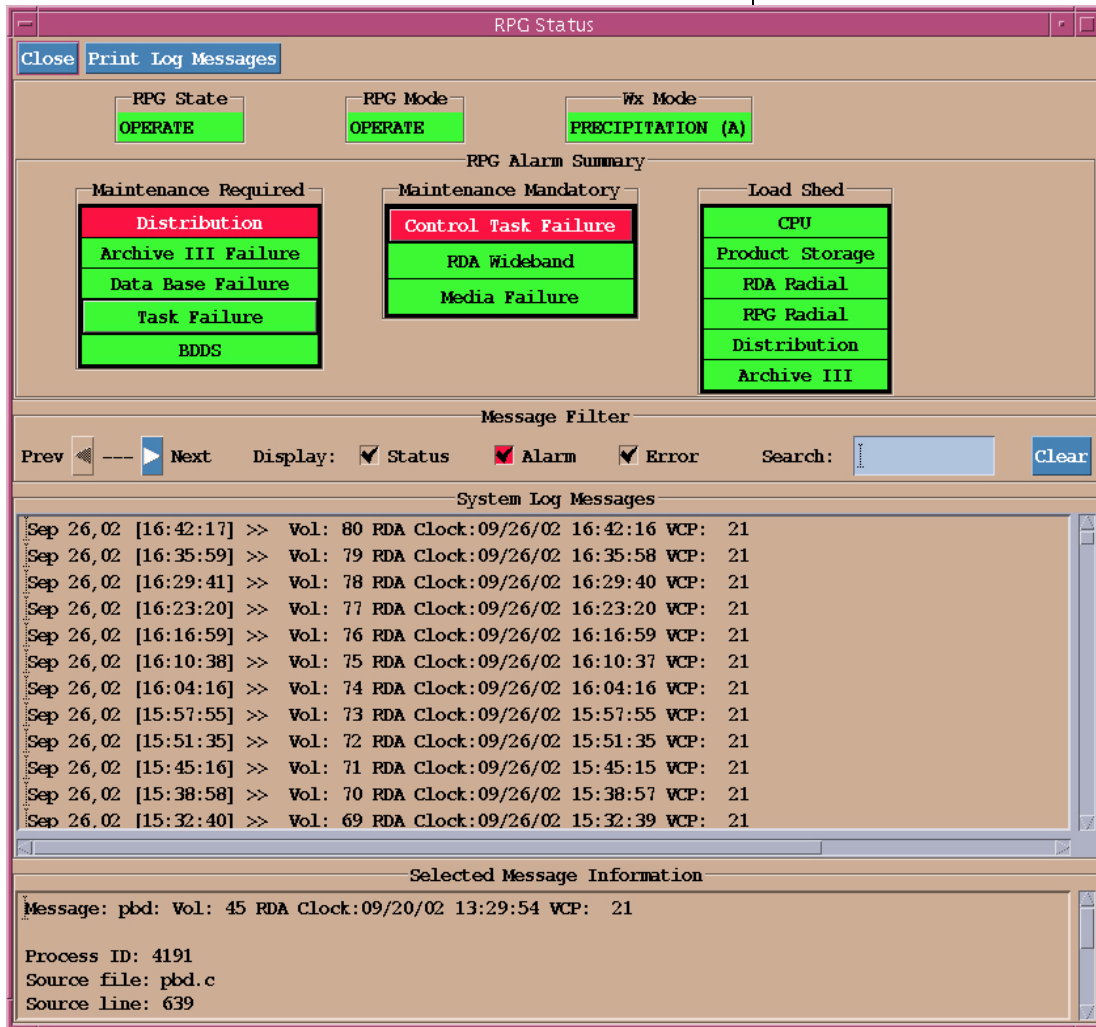
**Display RPG Status** | The procedure to display the RPG Status has not changed in RPG Build 3.



RPG HCI main screen

**Note that a review of the RPG HCI procedures is available in the RPG Build 3 EPSS.**

## RPG Build 3 Training

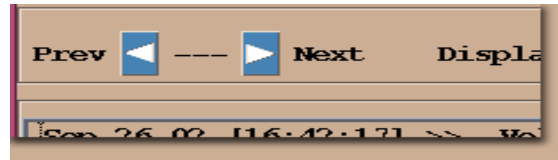


RPG Status window

The System Log Messages are displayed across multiple pages in increments of 250 per page. When the RPG Status window is opened it displays the most current page. The pages are navigated by left clicking the Prev and Next page

### Navigation

buttons which display the previous and subsequent 250 messages, respectively.



RPG Status log - Page buttons

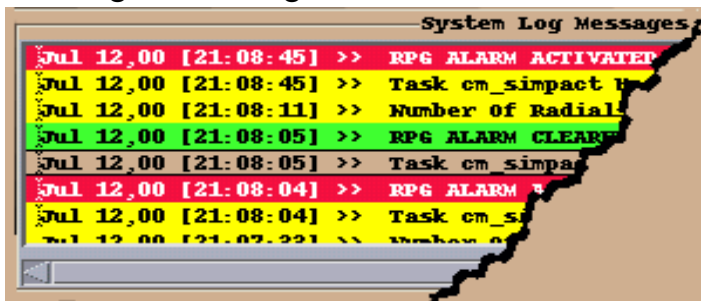
The Message Filter allows system log messages to be selected for display/non-display in the System Log Messages section by message type: Status, Alarm, or Error messages. A left click on the the box to the left of the message type toggles the check mark on/off. A check will display the type selected. In addition, the operator can search for a specific string of text that may be part of a given status message. The Clear button clears out the Search entry and returns the log to the filtered messages.



RPG Status log - Message Filter section

The System Log Messages section is continuously updated with the latest message appearing on the top line. Scroll bars are available along the right

side to view older messages and along the bottom to view longer messages.



RPG Status log - System Messages section

Double clicking with the left mouse button on any one of the messages in the System Messages section displays additional information. This is called Selected Message information and it is displayed in the Selected Message Information section at the bottom of the RPG Status window. The next oldest message can also be viewed in this section by pressing the tab key once.



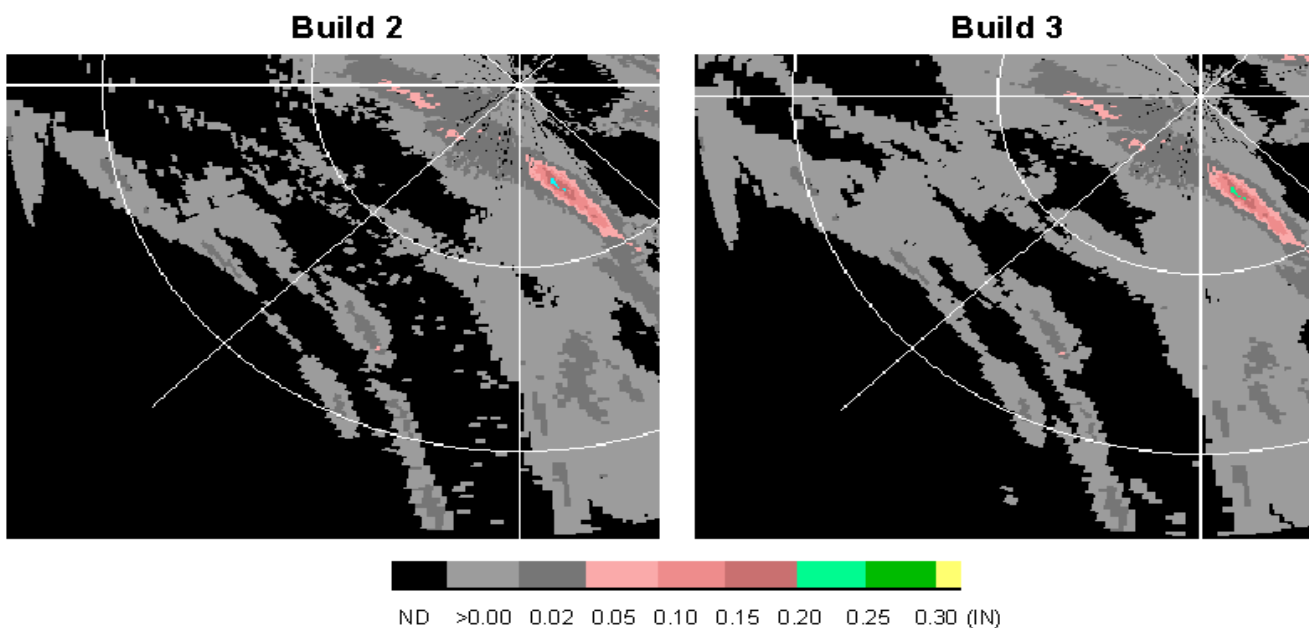
RPG Status log - Selected Message Information section

Within Open RPG Build 1, a fix was installed to address a long standing problem of underestimation of precipitation in the Precipitation Processing System (PPS) accumulation products. However, this “fix” yielded very low levels of artificial accumulations in the hourly-based products (OHP, USP, and THP) similar to those generated by ground clutter and anomalous propagation. These “Residuals” are normally quantitatively trivial (a trace) and are removed by a filter that eliminates all trace accumulation amounts. However, in situa-

## 7. Correction to “Residuals” in Hourly-Based Precipitation Products.

tions of prolonged rainfall events in which the PPS runs for extended hours without the Precipitation Category resetting to 0 (No Rain), the residuals may become widespread and may exceed the filter, making them quantitatively significant. These residuals not only affect the hourly-based products, but may also yield erroneous quantitative amounts in the “Digital” PPS accumulations that are used in the river and streamflow models used for hydrological applications.

To correct this problem, a fix has been implemented within the RPG Build 3 PPS Rate/Accumulation algorithm to remove the phenomenon of the Precipitation Residuals as well as the need for the filter.

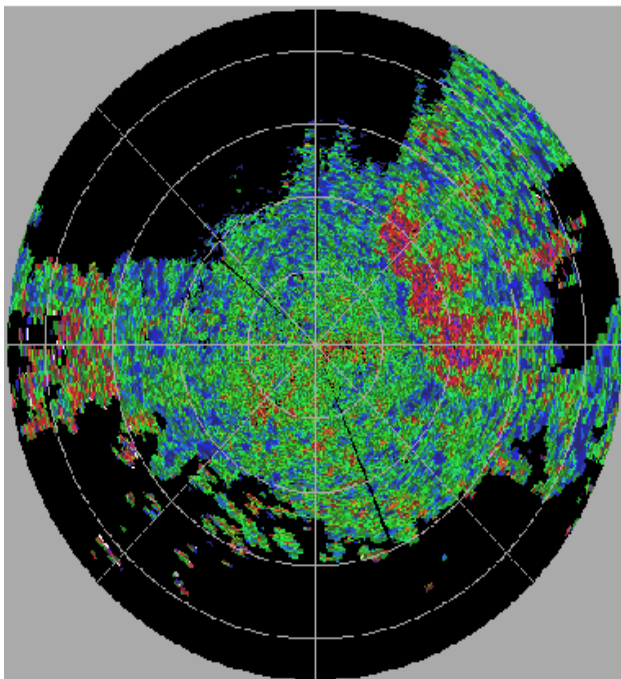


Note the removal of the “residuals”, south through west of the RDA, in the Build 3 version.

The original Radar Echo Classifier (REC) Algorithm, which was fielded with RPG Build 2, inaccurately decoded the Doppler velocity and spectrum width data by 1/2. This caused the REC to identify too much AP/clutter in regions with Doppler data, which in turn generated higher clutter likelihood percentages on the CLR and CLD products. The Build 3 “fix” corrects this problem. The following are examples of CLR and CLD before and after the correction was applied.

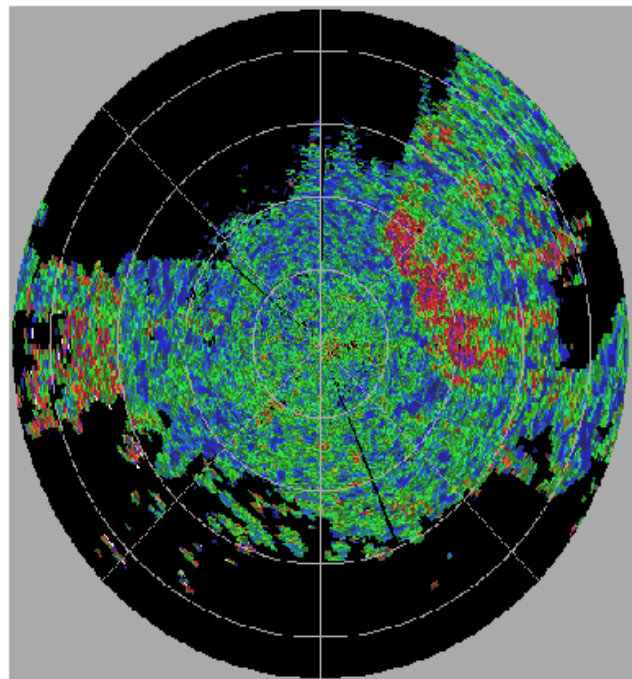
## 8. Correction to the Generation of the Clutter Likelihood Reflectivity (CLR) and Clutter Likelihood Doppler (CLD)

**Pre-Build 3 CLR**



**AP/Clutter**  
 Blue <10 %  
 BlueCyan <20 %  
 GreenCyan <30 %  
 Green <40 %  
 GreenYellow <50 %  
 Orange <60 %  
 Red <70 %  
 Red/Purple <80 %  
 Blue/Purple <90 %  
 Grey/White <=100 %

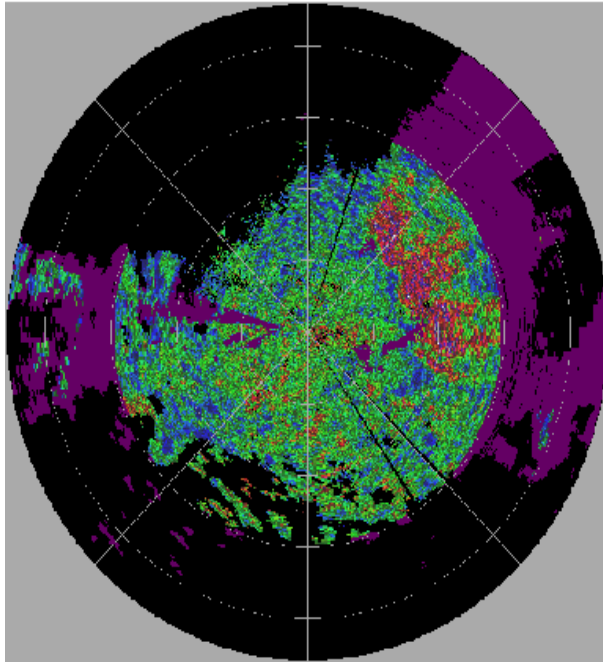
**Build 3 CLR**



**AP/Clutter**  
 Blue <10 %  
 BlueCyan <20 %  
 GreenCyan <30 %  
 Green <40 %  
 GreenYellow <50 %  
 Orange <60 %  
 Red <70 %  
 Red/Purple <80 %  
 Blue/Purple <90 %  
 Grey/White <=100 %

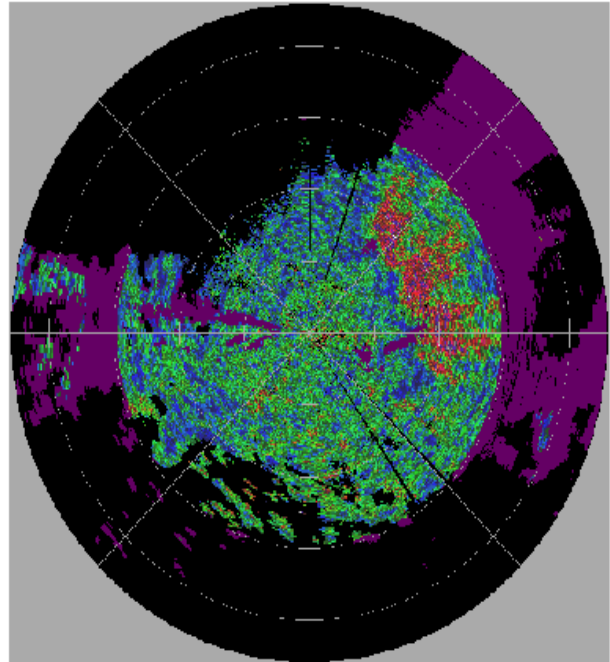
Note the reduction in percentages especially in the center of the Build 3 CLR image.

Pre-Build 3 CLD

AP/Clutter

Blue	<10 %
BlueCyan	<20 %
GreenCyan	<30 %
Green	<40 %
GreenYellow	<50 %
Orange	<60 %
Red	<70 %
Red/Purple	<80 %
Blue/Purple	<90 %
Grey/White	<=100 %

Build 3 CLD

AP/Clutter

Blue	<10 %
BlueCyan	<20 %
GreenCyan	<30 %
Green	<40 %
GreenYellow	<50 %
Orange	<60 %
Red	<70 %
Red/Purple	<80 %
Blue/Purple	<90 %
Grey/White	<=100 %

Note the reduction in percentages especially in the center of the Build 3 CLD image.

**Summary**

This document provides an overview of the Deployment state of knowledge of the operationally relevant impacts of RPG Build 3. While one of the RPG Build 3 changes is apparent at the RPG HCI (RPG Status Window), the others will not be apparent until the fielding of future AWIPS Builds.